

be continued for the time being in consideration of his important work in connection with the discussion of the results obtained at the Ben Nevis observatories. The complete or partial success of the weather predictions was very satisfactory during the year in question, *e.g.* harvest forecasts, 89 per cent.; forecasts appearing in morning newspapers, 88 per cent.; in both cases the best results were obtained in eastern and southern England. The number of storm-warning telegrams justified by subsequent gales or strong winds was 88.4 per cent. The committee points out that the service of storm warnings, which is extremely difficult on account of meteorological reasons, is aggravated by the frequent impossibility of getting telegrams delivered on the day of issue when dispatched in the evening or on Sundays, and it proposes to give this serious matter further consideration in the current year. The ordinary work of the marine and land branches has been much augmented by the reduction and tabulation of the observations of the National Antarctic Expedition and of auxiliary observations made in connection therewith, both at sea and on land, south of 30° S. latitude.

We have been looking rather carefully at the last published meteorological chart of the North Atlantic and Mediterranean for September, prepared by Commander Campbell Hepworth, marine superintendent of the Meteorological Office; one cannot help being struck with the almost crowded amount of information useful and interesting to seamen that it contains. Like its younger sister, the monthly chart for the Indian Ocean, the face is chiefly occupied by roses, showing for areas of 5° of latitude by 5° of longitude the frequency, direction, and average force of the winds; by waved arrows, showing the direction of ocean currents and the maximum and minimum set in twenty-four hours; and by routes recommended for steam and sailing vessels respectively. The regions where fog is most prevalent are also shown, and the icebergs most recently observed along the Transatlantic steamer routes. The most southerly berg reported up to the early part of August was roughly in 45° N. 47° W., and the most easterly in 47° N. 40½° W. On the back of the chart are given, *inter alia*, charts of tidal currents round the British Isles at the successive hours before and after high-water at Dover, and a co-tidal chart by Dr. Berghaus, with a useful explanation by Sir G. H. Darwin. As we are in the season of West India hurricanes, indications of their approach are explained and directions are given as to the most advisable steps to be taken when the centre of such a storm has been located.

The monthly meteorological chart of the North Atlantic for September, published by the Deutsche Seewarte, contains, generally speaking, similar useful information to that issued by the Meteorological Committee. The scale is somewhat larger than that of the English chart, and the wind-stars are printed in blue, the force, according to the Beaufort scale, being represented by feathers on the shafts of the arrows; altogether they form a prominent feature of the chart. The changes in the areas of high and low barometric pressure and other weather conditions shown graphically are also explained concisely in the text. On the back of the chart the true and magnetic bearings for a large number of points on the coasts when two lights or other objects are seen in line from the deck of a vessel afford an easy method of determining the deviation of the ship's compass. There are also small charts showing the mean isobars, isotherms, percentage of frequency of storms and calms for various localities in September, and the annual change in the magnetic declination. These pilot charts, brought as closely as possible up to the date of publication, are of the greatest practical value to seamen.

GEOGRAPHY AT THE BRITISH ASSOCIATION.

IN his presidential address to Section E, Sir George Goldie took the more or less obvious course of reviewing the progress of geography during the quarter of a century that had elapsed since the association last assembled in that city; but while necessarily saying something of the progress of exploration during that interval, he wisely passed rapidly over this side of the subject, and addressed himself chiefly to the wider aspects of the growth of the

scientific treatment of the subject and the spread of the geographical spirit among the people at large. The address was therefore unusually valuable from the point of view of all who are interested in the present position and future of the subject, both as an item in the educational curriculum of the country and as a study of undeniable importance to the general welfare of the nation.

There was a particular fitness in laying stress on this side of the question from the fact that, twenty-five years ago, as Sir George Goldie pointed out, a true conception of the functions and scope of geography was confined to a very limited circle of specialists, so that the progress so far made may be said to belong exclusively to the period under review. The investigation undertaken by the Royal Geographical Society, which was undoubtedly the starting point of any success since achieved, was, in fact, set in motion a few years after the previous York meeting of the association. The report issued by the society as a result of Dr. Keltie's inquiries showed how entirely inadequate were the methods of geographical tuition in those days, and the little importance, with one or two praiseworthy exceptions, attached to it in educational circles. The "absurd prejudice" which, as then pointed out by one of the few more enlightened teachers, regarded the subject as unworthy of the attention of first-rate men, has happily since been to a large extent overcome.

Sir George Goldie aptly diagnosed the source of our weakness as being, not the absence of the necessary raw material, for few countries possessed a literature of travel and exploration so wide and of so high a class as ours, but the paucity of men qualified to apply scientific method to this raw material, and the want of an institution where a thorough training in geography might be obtained. He was able to point to the large measure of success which has attended the efforts of the Royal Geographical Society and its coadjutors to remedy these defects, as evidenced in the present position of geography at Oxford and Cambridge and other of our universities. As a main cause of a spread of interest in the subject among the people at large he assigned the marked re-awakening of the spirit of colonial expansion, from 1884 onwards, and held that "empire-building is an even greater factor than war in advancing and popularising geographical knowledge."

As regards the future, he pointed out that though the popularity of a subject is by no means a test of its place in the ranks of science, the democratisation of geographical ideas is a very hopeful feature, by reason of the widening of the area from which students can be drawn and men of genius evolved. In conclusion, he gave a by no means contemptible list of books and papers as samples of the work recently produced in this country under the stimulus of scientific method applied to geographical study.

Among the papers, discussions, and lectures which formed the remaining programme of the section, one by Mr. G. W. Hope, a young American professor from the Ohio State Normal College, may be first mentioned, on account of the close bearing which it had on the subject of the presidential address. In a valuable and suggestive paper Prof. Hope urged the importance of Social Geography as a subject of study which has hitherto been too much neglected. The paper well exemplified the wide field open to the student of the new geography, and the need that it should be taken up by first-rate men if it is to lead to the most valuable results. The speaker dwelt, for instance, on the wide and thorough knowledge, not merely of geography in its narrower sense, but of allied subjects such as history, technology, and economics, which is indispensable for a fruitful study of the problems of social distribution. His avowal that he had himself approached the subject largely under the inspiration of the geographical movement in this country should give much encouragement to those who have worked so strenuously in its furtherance.

A large part of two mornings was taken up with well-sustained discussions, one on coast erosion, the other on a proposal for improved geodetic measurements in Great Britain. The former was opened by a paper by Mr. Clement Reid, F.R.S., who insisted on the need of approaching the subject with an adequate knowledge of past geological events in order to gain a comprehensive grasp of all the factors. The erosion of our coast must be studied in conjunction with the deposition of the material!

eroded, and when this is done we find that the process has not continued regularly for an indefinite period, but began, as now manifested, only some 3000 or 4000 years ago. In Neolithic times, according to evidence supplied by buried land surfaces, the sea stood 60 feet lower relatively to the land, and on the south and east coasts of England the rising downs were separated from the coasts by a wide plain. About 4000 years ago there set in a rapid but intermittent subsidence of the land or rise of the sea, on the completion of which the coast erosion now in operation began. In course of time shingle beaches and sand dunes were formed from the eroded material, and supply the best protection against further inroads. Much valuable alluvial land has also been formed in sheltered estuaries, so that it is an important question whether the net gain from protective works (if existent at all) would justify the enormous outlay involved. In the discussion which followed (in which Prof. Percy Kendall, Mr. Whitaker, Mr. E. R. Matthews, and others took part) the need of taking a broad view of the whole question was again and again emphasised, instances being given of the detrimental results of uncoordinated protective operations. Mr. Matthews, an engineer from Bridlington, gave some instructive details as to recent changes on the Yorkshire coast.

The geodetic discussion was opened by Major E. H. Hills, who pointed out that though the fundamental triangulation of these islands was excellent work for the time at which it was done, it is now far behind the standard of modern work of its class. This is the more regrettable, inasmuch as it prevents the coordination of British with Continental work, although the necessary observations to connect the two series have actually been made, and such coordination is of high importance in connection with questions such as the determination of the figure of the earth. All that is absolutely necessary is to connect geodetically, by as good a set of triangles as possible, the extreme points of our islands, and, were this done, amplitudes of 10° and $11\frac{1}{2}^\circ$ respectively would be added to two very important geodetic lines, viz. the meridional arc through the Greenwich meridian and the longitudinal arc along 52° N., which at present extend through 18° and 57° . Major Hills's proposals were warmly supported by Colonel D. A. Johnston (who presided at the discussion), Prof. H. H. Turner, Major Close (who mentioned as a less ambitious scheme the measurement of the central meridian of England running north from Southampton), Colonel Hellard, director of the Ordnance Survey, and others, the small cost of the undertaking and the reproach to British science involved in the existing state of things being generally insisted on. At the close of the discussion Mr. E. A. Reeves described a new form of range-finder invented by him, which, though at present in an experimental stage only, gives promise of proving of great use in survey work as well as, possibly, for military purposes.

Several of the papers described the scientific results of recent expeditions. Mr. J. Stanley Gardiner, besides presenting the report on the general work of the Percy Sladen expedition in the Indian Ocean, described the Chagos Archipelago in detail, discussing the coral formations and touching also on the life conditions, especially of the vegetation. He showed that there was evidence here, as throughout the Indo-Pacific coral-reef region, of a relative rise in the land-level reaching from 5 feet to 35 feet, and probably due in great part to a withdrawal of water from the equator by the piling up of ice in the Antarctic. The atolls seem to have been formed on submerged shoals by coral and nullipore growth on the edges of the latter, and the lagoons show a progressive increase in depth and area through solution, boring and triturating organisms, and tides. Mr. R. N. Rudmose Brown described the South Orkneys and other localities in which scientific collections had been made by the Scottish Antarctic Expedition; Mr. J. Parkinson gave an outline of the physical structure of southern Nigeria—a subject on which little has hitherto been known—from observations during a mineral survey of the region under the auspices of the Imperial Institute; and Mr. James Murray sketched the general scientific results of the survey of the Scottish lochs, discussing in particular the "internal seiche" which has been brought to light, and was explained as occurring on the cessation of a gale which

had maintained a temporary equilibrium between two bodies of water of different densities separated by an oblique line of separation.

Two papers dealt with the economic side of geography. That by Major Beacom, of the United States Legation, gave a most interesting account of the vast irrigation projects inaugurated within the past few years by the United States Government, enlarging in particular upon the Colorado River as the American Nile, and the changes in the Colorado desert due to irrigation. Prof. L. W. Lyde spoke of the wheat area in central Canada, showing how the climatic conditions favour the growth of that crop, especially along a line through Brandon and Battleford. He expressed a high opinion of the probable output of wheat from this area in the immediate future, but held that wheat growing was here eminently the work of the small farmer.

At the afternoon meetings illustrated lectures appealing to a more general audience than some of the above were given. Prof. W. M. Ramsay gave an instructive account of the past and present of Asiatic Turkey as influenced by physical conditions, tracing the fortunes of the region through their various vicissitudes, and forecasting a prosperous future from the advent of railway communication. Major P. M. Sykes described a tour in south-east Persia, dwelling on the many interesting historical associations and speaking of the ruined cities of the Narmáshir district. Mr. Yule Oldham interested a large audience with an account of the visit of the association to South Africa in 1905, while, lastly, Mr. Trevor-Battye showed a striking series of views illustrative of life and nature on the Zambesi above the falls, which he ascended at the close of the same visit of the association.

PHYSIOLOGY AT THE BRITISH ASSOCIATION.

SEVERAL subjects of great practical importance were discussed at the Physiological Section of the British Association; so much was this the case that the section proved to be the resort of larger audiences than formerly, and before the end of the week the building placed at the disposal of Section I was all too small for its purpose.

Of the discussions, none was more appropriate to York than that introduced by Dr. F. Gowland Hopkins on the minimum proteid value in diet. This question has two aspects, the physiological and the sociological; the former was the subject of extended researches some time back under the guidance of Prof. Atwater and Dr. Benedict, and more recently under the very able superintendence of Prof. Chittenden at Yale. It is, however, the sociological aspect of the question which gives it an especial interest in York, for in that city, as is very generally known, Mr. B. Seeborn Rowntree has made a very laborious and complete investigation of the dietetic conditions which obtain amongst the poorer classes, and has convinced himself that about one-quarter of the whole population is insufficiently fed. The value of his research depends essentially upon a correct judgment as to the minimum diet upon which a labouring man can perform an efficient day's work. The sociologist is therefore dependent upon the physiologist for his fundamental data.

The physiological requirements of the body are twofold—requirements of matter and requirements of energy; the necessary carbon and nitrogen must be provided, and they must be provided in a form which yields the number of calories equivalent to the energy dissipated by the human organism as work and heat. The subject was greatly simplified by Dr. Hopkins, for he showed that as the practical outcome of a large number of researches the energy value of the food might be almost disregarded. "It always worked out," he said, "that if the nitrogen-value of the food was looked after the calorie-value would look after itself." Very different views obtain as to the minimum nitrogen value of a daily ration, and the disparity of view has been much increased within the last five years. We used to think that 100 grams of proteid food per day, giving 15 grams of nitrogen, was a somewhat restricted diet. Prof. Atwater has raised this figure considerably, whilst Prof. Chittenden has reduced it. Facilities have